

REMARKS/ARGUMENTS

Claims 1-2 and 5-12 are in the application. Claims 1 and 12 are independent.

Claims 1 and 12 have been rejected under 35 U.S.C. §102(e) as anticipated by Umehara, U.S. Patent No. 5,882,956. The remaining claims have been rejected as either anticipated by Umehara, or obvious over Umehara in combination with another reference. Reconsideration is requested.

Claim 1 calls for, in combination with other limitations:

laying said thin flexible film on a thin semiconductor wafer of a second area, said semiconductor wafer being provided with a plurality of spaced apart semiconductor die, each of said semiconductor die having a respective third area which is substantially less than said first area;

preheating said semiconductor wafer and said thin flexible film to partially cure said thin flexible film, thereby forming adhesion between said thin flexible film and said semiconductor wafer[.] (Underlining added.)

Claim 12 calls for, in combination with other limitations:

laying a thin, flexible, polyimide, insulative film, which is separate from said wafer, and said wafer atop one another to form a film/wafer structure;

preheating said film/wafer structure to partially cure said thin flexible film, thereby forming adhesion between said thin flexible film and said wafer[.] (Underlining added.)

Thus, in a process according to the present invention, a wafer and insulative polyimide film are laid atop one another and then heated to partially cure the polyimide film in order to attach the film to the wafer.

It has been set forth that Umehara teaches laying a film of polyimide over a wafer, and then partially curing the film. A careful reading of Umehara establishes, however, that the polyimide layer 4 used in Umehara is partially cured before it is attached to the wafer. Specifically, Umehara teaches that the polyimide bonding sheet 7 is formed by attaching a partially-cured polyimide adhesive layer 4 to polyimide type resin 3:

In the use of thermosetting polyimide type resin, a temporary bonding is first effected with the use of the resin in a semicured stage (generally known as "B stage") and then a thermal curing is performed to thereby convert the adhesive layer into a polyimide.

Thus, when thermocompression is applied to attach the polyimide adhesive layer 4 to the wafer the polyimide is in partially-cured stage, rather than being partially cured by the thermocompression step. This conclusion is supported by the fact that Umehara suggests rather high temperatures (up to 300°C, column 6, lines 55-57) for thermocompression, which under usual circumstances leads to the curing of the polyimide, rather than its partial curing. Note that Umehara teaches heating the lead frame to a temperature between 100-300°C when assembling the die on the lead frame. Column 7, lines 42-44. This teaching further supports the conclusion that the thermocompression step used to attach the polyimide adhesive layer 4 to the die actually cures the polyimide rather than partially-curing the same.

In addition, claims 1 and 12 call for simply laying the polyimide film on the wafer, rather than pressing the polyimide film on the wafer as taught by Umehara.

Furthermore, neither claim 1 nor claim 12 requires the intermediate steps required by the process taught by Umehara. Specifically, claims 1 and 12 call for laying the polyimide film on a wafer, partial curing of the film, dividing of the wafer into individual die, and then placing the die on preheated substrates. However, Umehara teaches forming polyimide bonding sheet 7 by attaching polyimide adhesive layer 4 to polyimide type resin 3, attaching the polyimide bonding sheet 7 to a wafer, placing the combination on expanding process sheet 8, dividing the wafer in a precise manner to avoid cutting into sheet for expanding process 8 (column 7, lines 3-7), picking the individual die such that the polyimide adhesive layer 4 is separated from polyimide type resin 3, and then placing the die on a substrate. Thus, compared to the process taught by Umehara, the process called for by claim 1 and claim 12 is far less complicated. It is noteworthy that Umehara actually teaches that using only a film of polyimide without more is undesirable. See column 2, lines 1-8.

Reconsideration of claims 1 and 12 in view of the foregoing is requested.

Claims 2 and 5-11 depend from claim 1, and, therefore, include its limitations. Each of these claims includes other limitations, which in combination with those of claim 1, are not shown or suggested by the art of record. Reconsideration is requested.

The application is believed to be in condition for allowance. Such action is earnestly solicited.

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